

### **REMARKS**

Claims 1, 4, 6-15, and 17-23 are all of the claims presently pending in the application. Applicant has canceled claim 3 without prejudice or disclaimer. Applicants have amended claims 1, 4, 8, 9, and 19 to define the claimed invention more particularly.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1, 3-4, 6-15, and 17-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tischler (U.S. Publication No. 2002/0028314) in view of Shibata (U.S. Patent No. 6,824,610).

Applicants respectfully traverse this rejection in the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention of exemplary claim 1, provides a method of producing a Group III nitride compound semiconductor substrate including forming a first Group III nitride compound semiconductor layer by a halide vapor-phase epitaxy method directly on a silicon (Si) substrate or after forming a buffer layer on said silicon substrate, forming a second Group III nitride compound semiconductor layer by a halide vapor-phase epitaxy method at a temperature of not lower than 1000°C after removing substantially the whole of the silicon substrate and removing a part of the first Group III nitride compound semiconductor layer from the rear surface by etching after a completion of the forming a second Group III nitride

compound semiconductor layer or during the forming a second Group III nitride compound semiconductor layer (e.g., see Application at page 7, lines 20-25). This feature is important for relaxing the stress between the silicon substrate and the first Group III nitride compound semiconductor so that the stress is substantially absent (see Application at page 6, lines 5-18).

## **II. THE PRIOR ART REJECTION**

### **A. The Examiner's Rejection**

The Examiner alleges that the claimed invention of claims 1, 3, 4, 6-15, and 17-23 would have been obvious over Tischler in view of Shibata. Applicants submit, however, that these references would not have been combined as alleged by the Examiner and that, even if combined, the alleged combination of references would not teach or suggest each and every feature of the claimed invention.

In rejecting claims 1, 3, 4, 6-15, and 17-23 the Examiner alleges, "*Tischler 314 pertains to a process for producing Gallium-Nitride (GaN) semiconductor substrates with multiple layers.*" (See Office Action dated November 6, 2007 at page 3). The Examiner attempts to rely on paragraphs [0002] – [0013] of Tischler to support this allegation. The Examiner, however, is clearly incorrect.

First, Applicants point out that paragraphs [0002]-[0013] do not discuss the device of Tischler. Indeed, paragraphs [0002]-[0013] discuss related background art at the time Tischler was filed.

Second, Tischler merely teaches forming a single crystal, single layer, bulk M\*N substrate. (See Tischler at paragraphs [0036] – [0094], specifically paragraph [0050]).

The Examiner further alleges,

*“Tischler 314 teaches processing parameters for HVPE method have temperatures growth for a GaN layer be between 1000-1200°C and the desired thickness range be between 1-1000 microns but preferably at 100-300 microns thus reading on claimed thickness and temperature variations as claimed by applicant (See Section 0050 and 0025) as well the ability to grow more than one layer of M\*N materials as suggested by the language of section 0051 (sic).”* (See Office Action dated November 6, 2007 at page 5). The Examiner, however, is clearly incorrect.

Indeed, nothing paragraph [0051] of Tischler teaches or suggests forming multiple GaN layers on a substrate. Indeed, paragraph [0051] of Tischler merely alleges that it is known in the art to form GaN layers by a vapor phase process.

Applicants submit that Tischler does not teach or suggest (nor make obvious) *“forming a second Group III nitride compound semiconductor layer by a halide vapor-phase epitaxy method at a temperature of not lower than 1000°C after said removing substantially the whole of said silicon substrate”*, as recited in claim 1, and similarly recited in claims 8, 9 and 19.

The Examiner maintains that (even though the Examiner changed the basis of his rejection) that this feature of the claimed invention would have been obvious in view of the teachings of Tischler.

The claimed invention recites forming a first Group III nitride compound semiconductor layer at first temperature and then forming a second Group III nitride compound semiconductor at a second temperature, which is different from the first temperature. This feature is not taught or suggested (nor made obvious) by Tischler.

Indeed, Tischler does not even teach or suggest forming a second Group III nitride compound semiconductor layer. The Examiner alleges that this feature is taught in paragraph [0051] of Tischler. The Examiner, however, is clearly incorrect.

This passage of Tischler does not teach or suggest forming a second Group III nitride

compound semiconductor layer. Paragraph [0051] of Tischler merely discusses known techniques for forming Group III nitride compound layers.

Furthermore, nowhere does Tischler teach or suggest forming a first Group III nitride compound semiconductor layer and a second Group III nitride compound semiconductor layer at different temperatures, let alone at the specific temperature ranges recited in the claimed invention.

Therefore, in summary, Tischler does not teach or suggest (1) forming more than one Group III nitride compound semiconductor layer; (2) forming more than one Group III nitride compound semiconductor at more than one temperature; and (3) forming more than one Group III nitride compound semiconductor at the specific temperatures recited in the claimed invention.

Indeed, the Examiner concedes that “Tischler 314 does not outright explicitly teach the first layer of the metal-nitride semiconductor being processed at a temperature of 800-900°C and the second layer of metal-nitride material (i.e., Group III in particular) manufactured at a temperature of not lower than 1000°C” (see Office Action dated November 6, 2007 at page 6).

The Examiner erroneously alleges, however, that “Tischler 314 does teach that the compound semiconductor is manufactured in the range of 800-1300 °C denoting that it would be conceivable to one having ordinary skill in the art at the time of the invention via routine experimentation to produce the structure at a variety of temperature levels and ranges depending on the state of the layer manufacture for the compound semiconductor device. There is nothing precluding in this reference or applicant’s remarks that would suggest one having ordinary skill in the art at the time of the invention would not understand or conceive of the process as claimed by applicant” (see Office Action dated November 6, 2007 at page 6). The Examiner, however, is clearly incorrect.

That is, Applicants again point out that the Examiners' above reasoning is flawed for several reasons, which are detailed below. Indeed, the Examiner appears to be applying an erroneous standard for establishing obviousness of the claimed invention. Specifically, the Examiner's above reasoning does not appear to be supported by any known source of U.S. patent law.

First, the Examiner's allegations regarding "routine experimentation" are erroneous. That is, the M.P.E.P. sets forth that "[w]here general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation" (see M.P.E.P. §2144.05). This standard, however, does not apply to the Examiner's rejection of the claimed invention.

That is, Tischler does not disclose the general conditions of the claim. Indeed, the Examiner is not merely alleging that Tischler teaches all of the process steps recited in the claimed invention and that routine experimentation would have established the specific temperature ranges recited in the claimed invention. In stark contrast, the Examiner is alleging that the actual steps in the process (e.g., forming a second Group III semiconductor layer at a second temperature) would have been obvious via routine experimentation. That is, the Examiner is alleging that the general conditions of the claim would have been obvious via routine experimentation.

Thus, the Examiner's reasoning is clearly inconsistent with the above standard.

Moreover, even assuming, *arguendo*, that the Examiner's application of the above standard was appropriate, the Examiner still has not established a *prima facie* case of obviousness.

That is, the M.P.E.P. clearly sets forth that "[a] particular parameter must first be recognized as a result-effective variable, i.e., **a variable which achieves a recognized result**,

before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation” (e.g., see M.P.E.P. § 2144.05; emphasis added). The Examiner has not established (indeed the Examiner has not even attempted to establish) that the features of the claimed invention are result-effective variables. Indeed, the cited references do not suggest any result as being affected by the Group III semiconductor layer forming temperatures, let alone for the desired results on the claimed invention.

Furthermore, Applicants submit that the Examiner has failed to establish a *prima facie* case of obviousness.

First, the Examiner has not even provided any rationale for modifying Tischler. Therefore, since the Examiner has not even provided a reason to modify the reference, the Examiner has clearly failed to establish a *prima facie* case of obviousness.

Second, as detailed above, Tischler (even if modified) fails to teach or suggest each and every feature of the claimed invention. That is, Tischler merely teaches forming a single Group III semiconductor layer at a temperature selected in a range from 800°C to 1300°C. Nowhere does Tischler teach or suggest forming more than one layer at more than one temperature.

Therefore, the Examiner has clearly failed to meet the requirements for establishing a *prima facie* case of obviousness.

Indeed, the Examiner merely alleges that “[t]here is nothing precluding in this reference or applicant’s remarks that would suggest one having ordinary skill in the art at the time of the invention would not understand or conceive of the process as claimed by applicant” (see Office Action dated November 6, 2007 at page 6). Applicants again point out that this allegation by the Examiner does not conform to any known obviousness standard.

That is, when determining patentability of a claimed invention, with respect to 35

U.S.C. § 103(a), the Examiner must consider “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made” (see 35 U.S.C. §103(a); emphasis added).

The Examiner alleges that it would have been “conceivable” through routine experimentation to produce the claimed invention. Similarly, the Examiner alleges that “[t]here is nothing precluding in this reference or applicant’s remarks that would suggest one having ordinary skill in the art at the time of the invention would not understand or conceive of the process as claimed by applicant” (see Office Action dated November 6, 2007 at page 6; emphasis added).

Applicants submit, however, that whether one skilled in the art would have “understood” the invention or whether it would be “conceivable” for the one of ordinary skill in the art to modify the teachings of Tischler are immaterial to establishing a rejection of the claimed invention under 35 U.S.C. §103(a). Indeed, the Examiner must establish that the alleged modification would have been obvious.

Furthermore, Applicants submit that the Examiner’s statement that “[t]here is nothing precluding in this reference or applicant’s remarks...” is also immaterial to establishing a *prima facie* case of obviousness. That is, the standard for establishing obviousness is not whether the alleged modification is precluded by the cited reference or the Application, but whether the alleged modification would have been obvious in view of the teachings of the cited reference.

Indeed, when attempting to establish a *prima facie* case of obviousness “[k]nowledge of applicant’s disclosure must be put aside in reaching this determination”. Indeed, “impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of facts gleaned from the prior art” (see M.P.E.P. §2142). The Examiner’s above

rationale is a clear example of impermissible hindsight reasoning.

Finally, in his rejection, the Examiner has merely paraphrased the claimed invention. While the Examiner's paraphrased discussion may relate to the teachings of Tischler, it does not accurately and completely explain the claimed invention. Therefore, if the Examiner wishes to maintain this rejection, we would again request the Examiner to address each and every feature of the claimed invention and to address the plain meaning of the claimed invention.

Applicants point out that each of the above traversal arguments have been repeatedly pointed out to the Examiner. If the Examiner wishes to maintain his rejection of the claims Applicants point out that the Examiner must respond to each of our traversal arguments.

Alternatively, the Examiner has alleged that Shibata would have been combined with Tischler to teach or suggest the claimed invention. Applicants submit, however, that Shibata would not have been combined with Tischler as alleged by the Examiner.

Indeed, Applicants submit that the Examiner continues to misunderstand the requirements for establishing a *prima facie* case of obviousness.

That is, as indicated above, the standard for establishing a *prima facie* case of obviousness is clearly set forth in the M.P.E.P.

Indeed, the Examiner alleges that it would have been "obvious to one having ordinary skill in the art at the time of the present invention to incorporate the teachings of Shibata 610 into that of Tischler 314 in order to showcase and highlight further various well known processing techniques in fabricating the GaN structures and in particular render that from the known teachings of Tischler 314 that it is obvious from the basic processing parameters to further develop various ways of growing the structures as highlighted by the multiple examples showcased in Shibata in 610." (See Office Action dated November 6, 2007 at page



8).

However, Applicants point out that the Examiner's alleged reasoning for modifying Tischler again fails to comply with any known standard for establishing a *prima facie* case of obviousness.

Indeed, even assuming, arguendo, that Shibata teaches various processing techniques, the Examiner has failed to provide any reasoning for one skilled in the art to modify the process of Tischler to include the processing techniques allegedly disclosed in Shibata. It is well established that when attempting to establish a *prima facie* case of obviousness, it is not enough for the Examiner to merely provide a number of references which each teach or suggest "well known" features. The Examiner must provide reasoning explaining why one of ordinary skill in the art would have been motivated to combine the teachings of the references. The Examiner has failed to do so in this rejection.

Moreover, Shibata (see Examples 9-11 and 13, which were relied upon by the Examiner) teaches forming a GaN layer and then forming an AlN layer. In stark contrast, however, Tischler is specifically directed to forming a GaN substrate, not an AlN layer. Accordingly, one of ordinary skill in the art would not have combined the teachings of Shibata, which are directed to forming a combination of AlN and GaN layers, in the process of Tischler.

Furthermore, Applicants submit that the Examiner's alleged motivation would change the principle of operation of Tischler. Applicants point out that M.P.E.P. § 2143.01 states: "If the proposed modification or combination of the prior art would change the principal of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." Therefore, in addition to the reasons set forth above, one of ordinary skill in the art would not have been motivated to combine Shibata

with Tischler.

Thus, Shibata clearly fails to make up the deficiencies of Tischler.

Therefore, Applicants submit that these references would not have been combined as alleged by the Examiner. Accordingly, Applicants request the Examiner reconsider and withdraw this rejection.

**B. The Examiner's Response to Arguments**

In the Response to Arguments section of the Office Action, the Examiner alleges, "one cannot show nonobvious by attacking references individually where the rejections are based on combinations of references", citing *In re Keller*.

Applicants submit, however, that the Examiner has clearly misunderstood and inappropriately applied *In re Keller*. That is, the facts presented in *In re Keller* clearly do not apply to Applicants' arguments.

In *In re Keller*, the appellant provided an affidavit that was only concerned with whether one of the applied references suggested the use of digital timing in a cardiac pacer. That is, appellant only argued against one of the references, but did not provide any evidence that the other two references used in the 103(a) rejection did not teach or suggest digital timing in a cardiac pacer. The court stated that "the test is not whether a suggestion to use digital timing in a cardiac pacer is found in Walsh (which was the test applied by Dr. Cywinski), but rather what Keller in view of Walsh and what Berkovits in view of Walsh would have suggested to one of ordinary skill in the art". Therefore, in *In re Keller*, the appellant only attacked one of the applied references.

However, in stark contrast to the facts of *In re Keller*, Applicants have clearly provided arguments against each of the references (**and their alleged combination**) applied in the

Examiner's 103(a) rejections. Applicants submit that Applicants' arguments previously submitted to the Examiner are completely different from the facts of *In re Keller*.

Please note that this was previously pointed out to the Examiner. Surprisingly, the Examiner has maintained the above position without responding to Applicants' comments.

With respect to the alleged combination of Shibata and Tischler, the Examiner states, "Applicant's (*sic*) argue that Shibata 610 would apparently destroy the teachings of 314, which [is] an inaccurate depiction. Both references are analogous to the state of technology pertaining to metal nitride layers, as well GaN and AlN are both substitutionally equivalent materials as one having ordinary skill in the art would recognize the mutual benefits of combining both inventive teachings and obviate applicant's claimed invention." (See Office Action dated June 7, 2007 at page 9).

Applicants submit, however, that the Examiner's comments are not related to Applicants' traversal arguments.

That is, Applicants previously argued that the Shibata would not have been combined with Tischler because: (1) the Examiner had not provided any reasoning to support his allegation that it would have been obvious to combine Shibata with Tischler and (2) that combining Shibata with Tischler would change the principle of operation of Tischler.

The Examiner's comments, however, do not address either of these arguments. The Examiner merely contends that Shibata and Tischler are analogous art. Applicants point out that Applicants have not argued that Shibata and Tischler are non-analogous art. Applicants point out, however, that merely establishing that two references are analogous art does not meet the requirements, discussed above, for establishing a *prima facie* case of obviousness.

**C. Examiner's Rejection Fails to Address Each Limitation of the Claimed Invention**

Applicants point out that the Examiner, in rejecting the claimed invention under 35 U.S.C. §102 or §103 must address each and every limitation recited in the claimed invention. The Examiner, however, has failed to address numerous features recited in the claimed invention.

For example, exemplary independent claim 1 recites, *inter alia*, “forming a second Group III nitride compound semiconductor layer by a halide vapor-phase epitaxy method at a temperature of not lower than 1000°C after said removing substantially the whole of said silicon substrate.” The Examiner merely addresses forming a second layer, but does not address when the second layer is formed.

Furthermore, exemplary dependent claim 3 recites, *inter alia*, “removing a part of said first Group III nitride compound semiconductor layer from said rear surface by etching after a completion of said forming a second Group III nitride compound semiconductor layer or during said forming a second Group III nitride compound semiconductor layer.” The Examiner does not address this limitation in the rejection.

Exemplary dependent claim 4 recites, *inter alia*, “forming, as an etching stopper layer, a Group III nitride compound semiconductor layer comprising a larger amount of aluminum than an amount of aluminum comprised in each of the first Group III nitride compound semiconductor layer and the second Group III nitride compound semiconductor layer before said forming a second Group III nitride compound semiconductor layer, wherein said removing almost the whole of said silicon substrate comprises completely removing the first Group III nitride compound semiconductor layer.” The Examiner does not address this limitation in the rejection.

Furthermore, Tischler (taken alone or in view of Shibata) does not teach or suggest forming a Group III nitride compound layer, as an etch stop layer, in addition to the first and second Group III nitride compound layers.

Moreover, exemplary dependent claim 7 recites, inter alia, “*wherein said buffer layer comprises a Group III nitride compound semiconductor layer comprising at least one of aluminum and a multi-layer comprising at least one Group III nitride compound semiconductor layer comprising aluminum.*” The Examiner does not address this limitation in the rejection.

Furthermore, Tischler merely teaches forming a Si buffer layer, not a Group III nitride compound semiconductor buffer layer (e.g., see Tischler at paragraph [0051]).

Additionally, the Examiner has not addressed the limitation recited in newly-added, exemplary dependent claim 23.

Applicants point out that the above claim limitations are merely non-limiting examples of features the Examiner has failed to address in the Office Action. Indeed, as pointed out to the Examiner (**both above and in previously filed Responses**) in his rejection, the Examiner has merely paraphrased the claimed invention. While the Examiner’s paraphrased discussion may relate to the teachings of Tischler, it does not accurately and completely explain the claimed invention. Therefore, if the Examiner wishes to maintain this rejection, we would again request the Examiner to address each and every feature of the claimed invention and to address the plain meaning of the claimed invention.

#### **D. Claim Amendments**

As explained in detail in section A, above, Applicants maintain that the Examiner has clearly failed to establish a *prima facie* case of obviousness. Merely in an effort to speed

prosecution, however, Applicants have amended claim 1 (and similarly claims 8, 9, and 19) to recite, *inter alia*, “removing a part of said first Group III nitride compound semiconductor layer from said rear surface by etching after a completion of said forming a second Group III nitride compound semiconductor layer or during said forming a second Group III nitride compound semiconductor layer.”

This feature was previously recited in dependent claim 3 and is not taught or suggested by the cited references (taken alone or in combination).

Indeed, as explained above in section C, the Examiner has failed to even address this limitation in his rejection of the claims.

Accordingly, in view of the above detailed traversal arguments and the amendments to the claims, Applicants request the Examiner to reconsider and withdraw this rejection.

## **V. FORMAL MATTERS AND CONCLUSION**

Applicants point out that several detailed traversal arguments have been repeatedly presented to the Examiner. If the Examiner wishes to maintain the current prior art rejections Applicants request the Examiner to address and respond to each of the traversal arguments.

In view of the foregoing, Applicant submit that claims 1, 4, 6-15, and 17-23 , all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. Applicant respectfully requests the Examiner to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, Applicant requests the Examiner to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

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The undersigned hereby authorizes the Commissioner to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0481.

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Respectfully Submitted,



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